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EXAMINING OPERATIONAL MEASURES OF PERFORMANCE: PERFORMANCE MEASURES MATRIX

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13. ABSTRACT (Maximum 200 words)

An investigation was conducted, of current methods and procedures used by the operational Air Force, to gather data relevant to individual job performance. The usefulness of these methods and procedures was evaluated, in terms of their utility for collecting job performance information, or as means of validating current methods. Interviews were conducted with Air Force Headquarters personnel, program managers, and Service members at the operational level in five AFSs: Aerospace Propulsion Specialist (454X0); Communication and Navigation System Specialist (455X2); Aerospace Ground Equipment Mechanic (454X1); Precision Measuring Equipment Laboratory Specialist (324X0); and Aircrew Life Support Specialist (122X0). The result is a matrix which summarizes information on the properties of performance information in current and emerging systems in the operational Air Force. We found no central Air Force-wide data bases associated with individual job performance for the systems reviewed.

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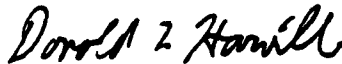| 17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
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The Office of Public Affairs has reviewed this report, and it is releasable to the National Technical Information Service, where it will be available to the general public, including foreign nationals.

This report has been reviewed and is approved for publication.

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PERFORMANCE MEASURES MATRIX

INTRODUCTION

The objective of this study was to determine the utility and validity of existing Air Force job performance measures used to evaluate the performance of airmen. This report contains the results of our investigation of the existing and emerging criteria, performance measures, and other indicators of job performance in the operational Air Force.

Background

The Job Performance Measurement/Enlistment Standards (JPM) Project, initiated in 1980, is a joint-Service research program exploring methods for assessing the job performance capability of enlisted personnel. As part of this project, the Air Force Human Resources Laboratory (AFHRL) has developed and administered different types of performance measures to first term airmen in various occupations. The developed measures in combination constitute the Job Performance Measurement System (JPMS). These efforts support the conclusion found in the literature that hands-on testing, although the most valid form of measuring, is not always feasible or practical because of cost, safety, and other factors. Due to its impracticality, hands-on test can not be operationalized in most situations, therefore, they will serve as benchmarks by which surrogate measures can be assessed. Four types of job performance measures (i.e., hands-on tests, interview tests, rating forms, and knowledge tests) were developed and administered to selected enlisted specialties as part of the JPM project.

AFHRL, in cooperation with the Performance and Technology Division of the Defense Training and Performance Data Center (TPDC), is developing a Training Technology Data Base (TTDB). The TTDB will link task, technology, and performance dimensions through development of job performance data and measurement methodology. The link will be established so as to capitalize on existing data sources which are compatible with the developed performance data and methodology. The TTDB will allow potential users of the Air Force JPMS to determine the job performance measures most suited to their particular application. A natural follow-on to this work is the identification of existing performance measures in the operational Air Force and to validate these identified measures using the results of the JPM project. The products of this study will provide a common body of knowledge about those existing and emerging job performance measurement technologies that have the potential to support DoD training.

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Method

The parameters and systems in the matrix were developed based on a review of the literature, completed as a part of the first phase of this project, and interviews with knowledgeable Air Force personnel.

An interview protocol was created based on the information required to complete the matrix. This protocol was loosely followed during the field interviews. The interview protocol is included in this report as Appendix A.

This task is focused on five specialties: 454X0 Aerospace Propulsion Specialist (Engines), 455X2 Communication and Navigation System Specialist, 454X1 Aerospace Ground Equipment Mechanic (AGE), 324X0 Precision Measuring Equipment Laboratory Specialist (PMEL), and 122X0 Aircrew Life Support Specialist (ALS). These Air Force Specialties (AFSs) are five of the eight specialties on which the JPMS procedures were developed. The other three specialties were: 492X1 Communications Systems Radio Operator, 272X0 Air Traffic Control Operator, and 732X0 Personnel Specialist. For purposes of comparison between the results of this task and the JPMS data, we selected AFSs that were included in the JPMS efforts.

We attempted to speak with individuals at all levels of the Air Force in order to get a broad perspective of what is being developed and what is operational. Interviews were conducted with Air Staff (HQ USAF) Functional Managers at the Pentagon for the five specialties of interest. The possibility of operational performance indicators were discussed and the functional managers supplied points-of-contact for MAJCOM Functional Managers, and contacts at HQ Strategic Air Command (SAC), Military Airlift Command (MAC), and Tactical Air Command (TAC), HQ Air Force Military Personnel Center (AFMPC) and HQ Air Force Training Command (ATC).

Interviews were then conducted at Randolph and Brooks AFBs. Researchers met with the training managers at Air Training Command for the five specialties of interest. On-the-Job Training (OJT), Core Automated Maintenance System (CAMS) and other procedures that might be used to document performance were discussed. Interviews were also conducted with training and classification personnel at AFMPC. Discussions were held with personnel involved in development of the Advanced On-the-Job Training System (AOTS), currently renamed the Base Training System. The acronym AOTS is used to indicate this system in the remainder of this report. The research staff interviewed CAMS system developers, where CAMS as well as other automated systems (Personnel Evaluation and Analysis Program (PEAP), Automated Maintenance Standardization and Evaluation Program (SALLY), and Quality Assurance Tracking and Trend Analysis System (QANTTAS) were discussed.

The research staff then visited four Air Force bases (2 MAC, 1 TAC, 1 MAC/TAC) to interview service members at the operational level in all five AFS of interest. The interviews consisted of questions based on the interview protocol and a discussion of day to day

activities. Approximately four airmen or noncommissioned officers (NCOs) were interviewed in each of the five specialties. At three installations, interviews were conducted with the Quality Assurance (QA) personnel on the evaluations that QA conducts. While at two of the bases, we spoke to the Training Managers.

Organization of the Report

The next section of this report describes the development of the matrix. The subsequent section of the report describes the performance measures found at the operational level followed by a section which describes the systems found at the operational level. The final section summarizes the report and presents our conclusions. The summary presents the completed matrix.

MATRIX DEVELOPMENT

HumRRO staff members developed a matrix to summarize information on the properties of performance information currently available in the operational Air Force. We accomplished this by identifying and accessing information on the performance measurement characteristics of existing job performance measures. The matrix provides information to answer the following kinds of questions about performance information:

1.   What information is included in the parameter (e.g., units of production, mistakes, sorties)?

2.   What type of information is included in the parameter (e.g., subjective, objective, behavioral)?

3.   What is the level of aggregation (e.g., individual, unit, organization, AFS)?

4.   Where is the information recorded or where is it obtained (e.g., written documentation, AF forms, maintenance records)?

5.   How is the information measured (e.g., observation, self-report)?

6.   How is the information currently used (e.g., documentation, determine maintenance needs, determine training needs)?

7.   How could the information be used for other purposes (e.g., making human resource decisions)?

8.   What is the quality of the information (e.g., reliability, validity)?

9.   How could JPMS information be helpful to the field in making better/other human resource decisions (e.g., selection and classification, training, program evaluation, and identification of individual training deficiencies)?

The parameters and systems in the matrix are based on a review of the literature, completed as a part of the first phase of this project, and interviews with knowledgeable Air Force personnel. We developed a preliminary matrix based on interviews with Air Force personnel at the Headquarters and program levels. We then refined the matrix based on interviews at the operational level. The kinds of performance measures searched for are described below.

Job Performance Measures

The matrix can include the Job Performance Measurement System (JPMS) procedures, as well as the operational Air Force measurement procedures we uncovered. The JPMS were developed for the Joint-Service Job Performance Measurement Project. Several procedures were employed in the JPMS such as walk-through performance tests (WTPT), job knowledge tests (JKT), and rating forms. These procedures are described below.

WTPT. The WTPT is a combination of the hands-on performance test (HOPT) and the interview technique. Hands-on tests are the highest fidelity measures of actual job proficiency because the HOPT measures performance while actually executing a work sample. However, these tests are expensive to develop and administer. The HOPT are used as benchmarks against which other measures are evaluated. Surrogate measures are the interview, JKT and others such as performance ratings. The WTPT blends aspects of the work sampling used in HOPT and the observer interview. In the interview the examinee talks through the procedures necessary to perform the task. The addition of the interview component allows for the measurement of critcal tasks that are too expensive, time consuming, or dangerous to access in the hands-on mode. The hands-on component is used for those tasks which can be performed safely without being too costly in time and resources and can be performed without damaging the equipment and components. In the interview component the examinee uses the "show and tell" approach, explaining how the task is performed through words, gestures, and demonstrations. Interview testing takes place in the work setting so the examinee can point to components and tools.

JKT. The JKT was developed to measure on-the-job performance and to provide a surrogate for the labor intensive and more expensive WTPT. The JKTs are multiple-choice paper-and-pencil tests designed to measure the examinee's knowledge of job technical content and procedures. Test items are based on the task oriented content of WTPT tasks.

Rating Forms. Rating forms are for job performance assessment by the supervisor, by the examinee, and the examinee's peer. The rating forms are task-specific, dimensional, global, or service-wide. Task and dimensional rating forms rate technical proficiency on specific tasks and dimensions relating to a specific AFS. Global rating forms are used to assess general technical and interpersonal proficiencies. Service-wide forms are used to rate proficiency in areas deemed important for success in the Air Force. Rating forms may also be used to assess the level of motivation of the examinee at the time of testing.

Information was collected on existing job performance systems for comparison to the JPMS. The kinds of information collected during the data collection phase are included in the following matrix parameters.

Matrix Parameters

The performance measurement parameters are shown in Figure 1. The parameters listed are the rows of the matrix. The second dimension, the columns of the matrix, are the job performance systems reviewed. The taxonomy has twelve parameters which fall within three broad areas: content, performance measurement, and evaluation. Also, two utility parameters are included that relate to current and other possible uses of the job performance data. The parameters are described below.

Content. Content parameters relate to the physical aspects of the data, the domain and participants.

Accessibility of data. Job performance data, to be useful as a part of the validation of selection criteria, must be accessible. The matrix indicates the ownership and location of the data, how the data are stored, and how the data may be accessed.

Domain. The domain includes the mission, occupational specialty, and echelon (e.g., individual, workcenter, unit, organization).

Participants. The main thrust is job performance measurement of the individual. This parameter can include rank, time in service, and other information pertaining to the individual.

Performance measurement. Performance measurement overlaps with content and evaluation parameters, as well as four mutually exclusive parameters. These are the item or function being measured, the associated data, the procedures used, and the method for recording the data.

Item measured. The item or function on which the job performance measure is taken. This may include a procedure, units of production, number of mistakes, or successful sorties, or time to failure of system following repair.

Associated data. An informational parameter for any other data associated with the performance measure.

Procedure. The procedure is the method for obtaining the performance data. The procedure may be observation, paper-and-pencil records, or electronic transmission.

Recording method. The method used to record the original data. The method may be a check list, special form, standard AF form, or from previously recorded maintenance records.

Evaluation. Parameters in the evaluation category deal with the quality of the job performance data.

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```
C
O     P
N     E
T     R
E     F
N     O
T     R
      M
      A  Accessibility of data
      N     Ownership, location, storage medium        ─────>
      C
      E  Domain
            Task or mission, Occupation (AFS),
      M     Echelon (individual, unit, org.)            ─────>
      E
      A  Participants
      S     Individual, team, unit                      ─────>
      U
      R  Item measured
      E     Units of production, mistakes, sorties      ─────>
      M
      E  Associated data
      N     Data associated with measures               ─────>
      T
         Procedures
E           Observation, records, etc.                  ─────>
V
A        Recording method
L           Written, AF forms, maint. records           ─────>
U
A        Type of information
T           Subjective, objective, behavioral           ─────>
I
O        Research questions
N           Readiness, MPT issues                        ─────>

         Fidelity
            Reliability, content-validity               ─────>

         Timing of data collection
            Unannounced testing, pre-test/post-test,
             related to training cycle/career, etc.     ─────>

         Bias in the sample and sampling
            All members, random selection, other        ─────>

            Current use of data                  <──────────

UTILITY
            Other uses of data                   <──────────
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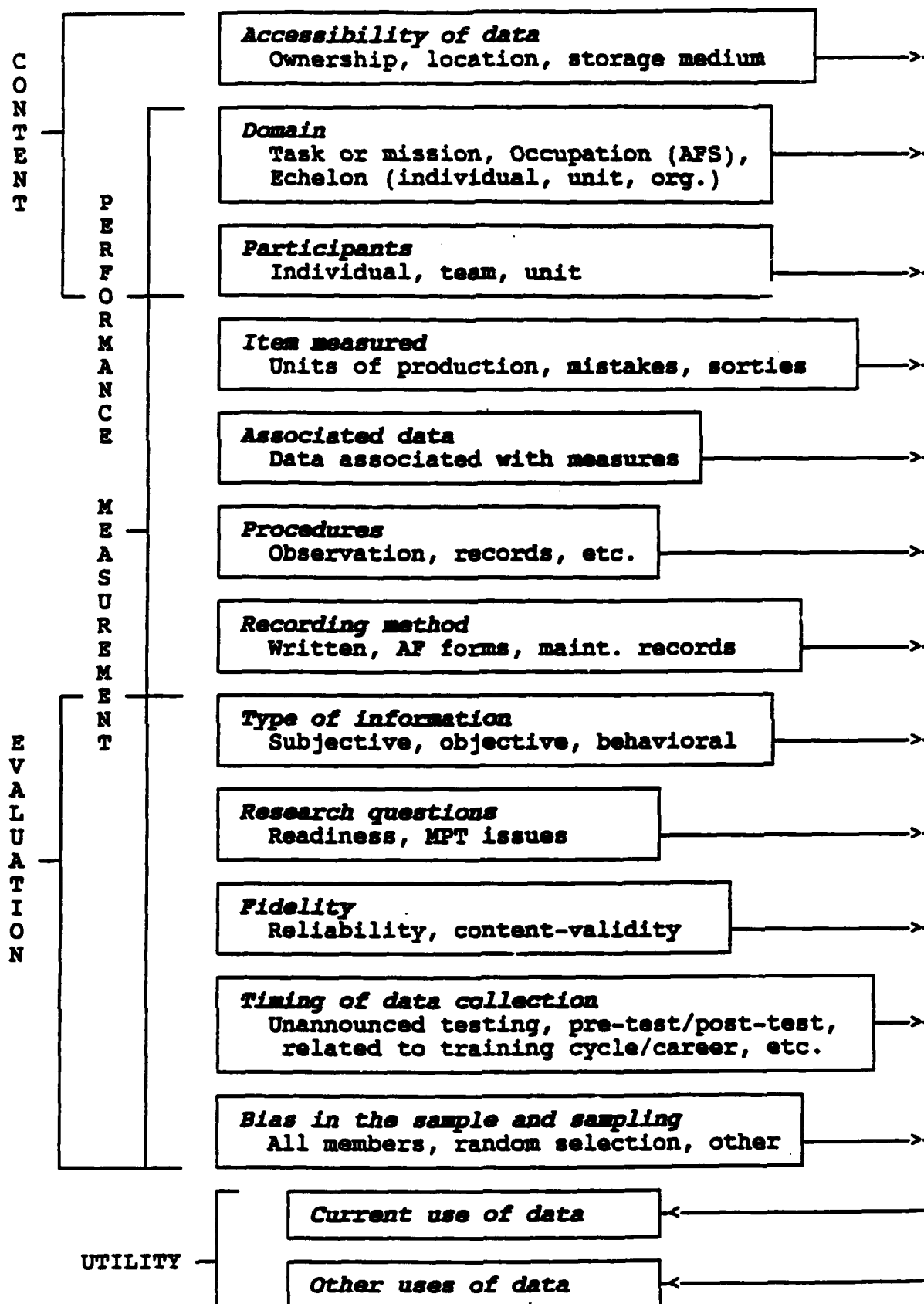
Figure 1 - Performance Measurement Parameters

Type of information. The matrix indicates whether the data are subjective, objective, or behavioral.

Research questions. This indicates the intended purpose of the recorded data. Is it for training effectiveness, unit readiness, promotion, etc.?

Fidelity. This parameter includes reliability and validity. Reliability is the degree of consistency between items from the same domain. Validity is the degree to which the job performance measurement instrument accurately measures what it is supposed to measure. We attempted to determine if the data collected on job performance systems have indicators of reliability and validity.

Timing of data collection. We looked at timing issues. Timing issues include announced and unannounced assessment procedures, timing of job performance measurement in relation to the career progress of individuals, timing within a training session, timing in relation to a broader training cycle, and timing in relation to the individual's Service career.

Sampling method. The sampling method was determined during data collection. The sampling method indicates how participants are selected.

Utility. Utility relates to the end product and its uses.

Current use of data. How the collected data is currently used.

Other possible uses of data. Other potential future uses of the data collected (e.g., research, promotion, training assessment).

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OPERATIONAL MEASURES

Operational measures found in existing and planned Air Force systems are:

Apprentice Knowledge Test (AKT)
Career Development Course (CDC)
Enlisted Performance Report (EPR)
Job Qualification Standards (JQS)
OJT Supervisor ratings
Quality Assurance/Quality Control (QA/QC) evaluations:
    Personnel Evaluations (PE)
    Quality Verification Inspection (QVI)
QVI Level
Specialty Knowledge Test (SKT)

Each of the operational measures is discussed below.

Apprentice Knowledge Test (AKT)

The AKT was developed as a tool to identify individuals who can bypass technical training school and go directly to an assigned unit. AKTs are 100 item, multiple-choice, domain-based tests. They include declarative, general aptitude, specialty-specific equipment, and job-relevant knowledge needed to perform at the 3-level. An AKT is developed first by SMEs who prepare an outline of the specialty knowledge required prior to on-the-job assignment in an AFS. The outline components are weighted to determine the number of items to be developed for each component. The SMEs and Air Force Occupation Measurement Center (OMC) test developers follow a dynamic, iterative process to develop test items. All items have four response options. After items are developed, the test is administered to the same SMEs, who then review the items for accuracy and clarity. The OMC test developers also review the final product. The qualifying scores for selected AKTs are based on the performance of technical school graduates.

Career Development Course (CDC)

The CDC is a study course and testing procedure primarily associated with skill level advancement. The courses are prepared for specific AFSs and as an integral part of the OJT program. The end-of-course exam must be successfully completed before an airman can be upgraded to the next higher skill level. The subjects of the course are those things an airman needs to know about their occupational specialty at their career level. The course involves self study materials. The supervisor or an assigned trainer works with the airman during the study course. Study is at the job site and in off duty hours. The course is modular and may have five or more volumes. There is a test for each volume administered at the job site with

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immediate feedback to the participant. When all volume testing has been successfully completed the airman goes to a designated testing center for the end-of-course exam.

Enlisted Performance Report (EPR)

The EPR is an annual performance review for each enlisted person. Also, there is a provision for a mid-term review and feedback. The airman's overall job performance is rated on a five point scale. The EPR emphasizes the "total person", rather than job performance alone. It is said to be less inflated than the previous system (Airman Performance Report (APR)) which was based on a nine point scale.

Job Qualification Standards (JQS)

The JQS are the tasks and standards associated with a particular AFS. An airman must demonstrate the ability to perform each of the tasks and be certified on each one. The JQS may include several levels of Specialty Task Statements (STS) such as:

> Air Force Job Qualification Standards (AFJQS)
> Command Job Qualification Standards (CJQS), and
> Unit, work center, or duty position requirements and standards.

AFJQS are Air Force wide standards. CJQS are command level standards; standards in addition to AFJQS required by the MAJCOM or installation command. Unit, work center, and duty position standards are additional requirements at the local level.

When a new person comes into a unit the supervisor or an assigned trainer will go through the JQS task list to determine which tasks the airman needs to be trained on. If the supervisor determines that upgrade training is needed the airman goes to the Field Training Detachment (FTD) for the training. After the FTD training the airman learns to perform the tasks associated with the job through OJT. When both the supervisor and the airman agree it is time, the supervisor will observe the airman performing the task. The satisfactory or unsatisfactory performance result is entered on the task evaluation form, Air Force Form 803, and the form is put in the OJT jacket. Recording the satisfactory performance on the task means the airman is certified to do the task.

OJT Supervisor Ratings

OJT supervisor ratings are made by both supervisors and commanders based on review of the OJT records and observed performance. The ratings are usually *projected, satisfactory,* or *unsatisfactory* and include the date of the rating. These ratings are periodic and scheduled evaluations to determine if an individual is making adequate progress on his or her OJT program.

Quality Assurance/Quality Control (QA/QC) Evaluations

Personnel assigned to QA/QC duties conduct several types of investigations both announced and unannounced. Two types of investigations are associated with evaluations of personnel. One is the Personnel Evaluation (PE) which involves observation of on-the-job performance. The observation may involve over-the-shoulder, interview, hands-on or a combination of techniques chosen by the evaluator.

The other type is the Quality Verification Inspection (QVI). Although the QVI is an inspection of equipment, the result of the inspection is associated with an individual who performed or was involved in the maintenance or repair. Passes and failures and the individuals involved are a part of the records maintained by the QA/QC.

Quality Assurance is under the Deputy Commander of Maintenance (DCM). An individual from the QA office visits the maintenance shops to conduct the inspection. The results of QA/QC evaluations are discussed with the supervisor. The supervisors are not given a copy of the inspections. The record of the evaluations are maintained by the QA/QC. The QA/QC prepare periodic reports of findings. The reports to the work units do not include names of individuals.

At some commands there are QA people assigned within the unit. This person conducts the day-to-day QA inspections. This information is not recorded in any standardized way.

QVI Level

The QVI Level is used exclusively in the PMEL specialty in conjunction with the PMEL Automated Maintenance System (PAMS). Because of the criticality and precision of the work, PMEL has a more stringent quality assurance system than the rest of maintenance.

Process. There are four QVI Levels. The QVI Level determines the percentage of items per level that get checked. Each person has a designated level. The percentage checked at each level are as follows:

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QVI Level	Percent Items Inspected
1 Coin	50%
2 Coin	25%
3 Coin	12.5%
4 Coin	6.25%

The word "coin" comes from the original system in which one-cent coins, contained in a four quadrant shaker, were actually used to determine whether the item was checked. The probability from the "coin" system is now programmed into the PAMS system. When the Quality Assurance (QA) person is entering the paperwork into PAMS, the systems alerts him/her if the person should be inspected.

When a new person joins the unit the first five items worked on are inspected, and if all five are passes, the airman enters at a 3-coin level. The QA person inspects 100% of the paperwork that goes in on each item to be sure it is all filled out correctly and to be sure an inordinate amount of time was not spent on the item. He then scans the item into the PAMS system. It is here that the system alerts the QA person if it is time for a QVI inspection.

The QA person inspects the equipment, if there is a failure the airman will move into a position called 4R. The next four items are pulled and if there are any failures, the airman is dropped down to level 3R and the next 4 items are checked there and so on. If there were no failures at the 4R level the airman moves on to 4*. At 4*, the items are inspected at the regular coin 4 rate, 6.25%, but if any of the next fourteen inspections are failures, the airman will be dropped to the 3R level. In order to move up to the next level, an airman must pass 18 consecutive inspections at the normal inspection cycle.

Because the inspections are based on chance, it is possible that an airman can go for many months without an inspection. In order to avoid this, it is built into the QVI system that an airman can only have 31 uninspected items and the next item is inspected.

There is a second type of inspection called over-the-shoulder inspection where a person, rather than the equipment, is inspected. A failure of an over-the-shoulder can result in the dropping of a level.

The QVI Level can be an indicator of job performance. However, the QVI Level needs to be used in conjunction with other factors. The QVI Level can relate to the type and kinds of equipment selected for calibration or repair. Production rates will reflect the type equipment worked on. Also, those who select harder work are more likely to get a failure, while those who play it safe with easier items are likely to have less failures.

Specialty Knowledge Test (SKT)

Where SKTs are available, they are used to assess the airman's knowledge relating to job tasks. The SKT is a written multiple choice test which airmen take when they become promotable. It primarily tests knowledge recall although some items are performance oriented. Tests are scheduled and announced in advance. This allows airmen to study and prepare for the test. The SKT score comprises one-fifth of the Weighted Airman Promotion System (WAPS) score used to select airmen for promotion.

The SKT is developed by Subject Matter Experts (SMEs) primarily from the CDC. SMEs also use material from regulations, text books, and other sources. There are two levels of the SKT: (a) one for promotion to E5 and (b) one for promotion to E6 and E7. The E6 and E7 tests cover the same basic material. However, since several years pass between promotion from E6 to E7, several revisions are made to the SKT by the time the airman takes the test for promotion to E7. The SKT is revised annually, items are reordered, and the answer key changed.

OPERATIONAL SYSTEMS

The automated systems in use, being implemented and planned by the operational Air Force are:

Core Automated Maintenance System (CAMS)
Advanced On-the-Job Training System (AOTS)
Personnel Evaluation and Analysis Program (PEAP)
Quality Assurance Tracking and Trend Analysis System (QANTTAS)
Automated Maintenance Standardization and Evaluation Program, SALLY
PMEL Automated Maintenance System (PAMS)
Aerospace Life Support Management System (ALSMS)

Core Automated Maintenance System (CAMS)

The CAMS is an Air Force directed project to improve management and utilization of maintenance resources through use of automated data processing for logistic information. CAMS was designed to support all base-level aircraft, ground-launched cruise missiles, engines, trainers, support equipment, test equipment, missiles, munitions, and communications-electronics maintenance. The *Training Management* subsystem and the *Quality Assurance/Quality Control* subsystem are discussed below.

Training Management Subsystem

The Training Management subsystem of CAMS was designed to extend the capability of training management personnel by reducing their administrative burden. The CAMS data base includes required training courses; inspection, special qualifications, and On-the-Job Training (OJT) information; training status, due and completed dates; and an individual's complete training history. This data base can be used to determine and validate training needs. CAMS implements OJT requirements in AF Regulation 50-23. The Training Management subsystem is described in Air Force Manual 66-279, Vol XVII.

CAMS is operational at most major maintenance locations. Workstations are in place at workcenter locations and are being used. CAMS will not have a central data base. The data bases are controlled at or below the MAJCOM level. Codes for the data are not compatible across MAJCOMs. The data bases are on a mainframe at the installation level. Modules in CAMS will vary reflecting MAJCOM and installation requirements.

There are no local data bases. Local units are tied into installation or higher level data bases. Units can access data from the data bases based on their level of access code. Each person has a unique ID number assigned at the installation level. There is a cross reference of ID to SSN. An operator with an appropriate access code may access data by name or SSN.

The performance indicators included in the Training Management subsystem of CAMS are discussed below.

Job Qualification Standards (JQS). CAMS provides a method of recording the progress of an airman during OJT. CAMS can be used as an automated version of the OJT Jacket. The task titles (STS listing) along with study references are recorded in the system. When an airman demonstrates he or she can perform a task, a code and date are entered into CAMS opposite that task statement. In other words, instead of circling a task statement on the STS listing in the OJT Jacket, an operator types in the code (e.g., T) and the date (e.g., 07 DEC 88) on a screen using CAMS. In addition to the task number, title, code, and date the following are included:

> Name
> Employee number
> Organization number, kind, and type
> Workcenter mnemonic and number
> Date assigned
> Initial evaluation date
> Evaluation exemption indicator
> Date of last evaluation
> Upgrade training (UGT) status and date
> Immediate supervisor name and number

The task listing in CAMS can include:

> Air Force Qualification Standards (AFJQS),
> Command Job Qualification Standards (CJQS), and
> Unit, workcenter, or duty position specific qualification
> > requirements and standards.

This system is used by the training manager and the workcenter supervisor to monitor the progress of personnel in training. It replaces the manually maintained STS and AF Form 797. OJT information can be viewed using a variety of screens; by individual, by task statement, by workcenter, etc.

Career Development Course (CDC). CAMS contains data on the CDC participation for each individual by name and employee number. It includes:

> Course code, sequence number, and volume number
> Volume start date, score and completion date (open book
>   practice exercise- not a test)
> Course exam (CE) status (c = completion; f = failed)
> CE completion data and score
> CE retest data

Apprentice Knowledge Test (AKT). CAMS includes the AKT score.

Supervisor and Commander Ratings. CAMS contains both supervisor and commander evaluations. The data contains evaluation indicators (0 = projected; 1 = satisfactory; 2 = unsatisfactory) and evaluation dates.

Quality Assurance/Quality Control Subsystem

The Quality Assurance/Quality Control (QA/QC) subsystem is described in *Functional Description FD-G83-004 Supplement VIIB*, August 1989. This subsystem is currently "on hold." Work on the subsystem is scheduled for the coming year. The QA/QC subsystem, like the other CAMS modules, will not be standardized throughout the Air Force. It will be MAJCOM specific. Data bases will be at the base level.

A locally approved form will be used to record the results of equipment inspections and personnel evaluations. The evaluations are classified by type: Completed Maintenance Action (CMA), Completed Maintenance Inspection (CMI), Completed Supervisory Inspection (CSI), Supervisory Evaluation (SE), Task Evaluation (TE), Evaluator Proficiency Evaluation (EPE), and Quality Verification Inspection (QVI). The results of the inspections and evaluations are entered into CAMS. Also, the system allows entry of the results of special inspections and evaluations.

A CMA is an after-the-fact evaluation of a previously completed maintenance action performed on an aircraft or equipment items. A CMI is an after-the-fact evaluation of a previously completed maintenance inspection of aircraft or equipment items. A CSI is an after-the-fact evaluation of a supervisor who has performed and documented an inspection of a completed maintenance action on aircraft or equipment items. An SE is an over-the-shoulder evaluation of a supervisor during actual task performance. A TE consists of an over-the-shoulder evaluation of a maintenance technician during actual job performance. The EPE serves as a certification process for people performing evaluations. The QVI is an inspection of an item or piece of equipment.

The QA inspector is required to document discrepancies and provide a rating for the evaluation. Entries into CAMS may include:

Transaction type (L = load; C = change; D = delete)
Date, shift, time, workcenter
Name, grade, control number, and type evaluation
Task or job description
Task code
The category or class of discrepancy
Whether the discrepancy is minor or major
Type of errors made
Summary statement

The QA/QC subsystem will provide for both user defined reports and automated reports. User defined reports will be available by name, task, workcenter, or other selected combinations. Reports can show type of evaluation, equipment and/or task, rating, date of evaluation, and next due date for any required evaluation. Also, historical reports will be available. CAMS will provide a list, sorted by a specified mnemonic code, of all assigned personnel and their personnel evaluation history for a user defined time period; or, a personnel evaluation history covering a specified time period for a specific employee/name.

An automated evaluation report is planned. The automated system will contain a matrix table for loading weighted or baseline requirements. The overall rating of the evaluation will be automatically calculated when the number, type, or category of discrepancies are entered. The system will automatically update training subsystem course codes and job qualification standards when an entered evaluation report satisfies a related periodic inspection requirement. Unsatisfactory completion of an automated inspection report will automatically schedule a follow-on evaluation within a user-defined time period.

Advanced On-the-Job Training System (AOTS)

The Advanced On-the-job Training System (AOTS), currently renamed the Base Training System, was developed to test a design concept for improving current practices in the Air Force On-the-Job Training (OJT) program. It is a computer-based, training management, training development and delivery, and training evaluation system designed to enhance OJT activities in the operational setting. AOTS was designed to be in strict compliance with Air Force OJT standards and AFR 50-23. The system focuses on job position qualifications, whereas OJT focuses on task qualifications.

Work began on AOTS in 1985 at Bergstrom AFB, Texas. The development team was AFHRL, Douglas Aircraft Company, and Ball Systems Engineering Division. The prototype system involved over 600 Active, Reserve, and National Guard personnel in five specialties for one year. AOTS is being expanded to cover other AFSs and other installations.

The expansion plan calls for a fully networked personal computer (PC) based system. Other possibilities are a stand-alone PC based system or a mainframe based system. The user level workstation configuration would be based on user needs. The workstation may include a printer, optical mark reader, interactive video disks, or any other required equipment. The installation system manager will have access to file space to store data bases and will have access to long haul communications networks. The Air Force and Functional Area Manager or MAJCOM system administrator will have similar equipment as the installation system manager. The development site will have all the hardware equipment used anywhere in the system.

AOTS has three components: *Management*, *Evaluation*, and *Training*.

Management Component

The trainer, evaluator or supervisor uses the Training Scheduler editor in the Management Component to schedule or forecast training or evaluation events. There are four events:

> Knowledge Training
> Knowledge Evaluation
> Performance Training
> Performance Evaluation

The Training Scheduler allows:

1. Trainers to schedule Knowledge Training and Performance Training events
2. Evaluators to schedule Knowledge Evaluation and Performance Evaluation events
3. Supervisors to schedule all four types of events

The Reports and Notices part of the Management Component permits both individual and summary reports of all training and evaluation results.

Evaluation Component

The Evaluation Component allows access to:

1. Knowledge test items (true/false and multiple choice questions)
2. Performance evaluation products (oral test guides and performance evaluation checklists.

Knowledge test. Knowledge test can be administered both on-line and off-line. Test administered on-line are automatically scored. A test administered off-line is scored by use of an optical mark scanner answer sheet or by manually entering the responses to each question using a keyboard. The system checks the off-line test results against the knowledge

test answer key file and accepts pass/fail results for each performance step and the performance test as a whole.

Up to 75 copies of an off-line test may be printed in response to a single authorized request from a workstation. The test control number will appear on each copy. A knowledge test answer key will also be printed if requested at the time that the test are printed.

Performance evaluation. The evaluation component supports pre-training, post-training, and quality control evaluations. All performance evaluations are administered off-line. Scoring is accomplished by using an optical scanner check list sheet or by manually entering the "pass" or "fail" ratings for each step in the check list. The evaluations are automatically scored by the system. No answer key is available or printed for a performance test.

The periodic selection for a quality control evaluation event includes the task to be evaluated, the airman to be evaluated, and two external evaluators. An automatic process identifies the airman to be evaluated and the external evaluator candidates for each task identified for evaluation. The Management component of the system notifies the QC Administrators of tasks, evaluatees, and evaluators identified as candidates for training quality control. The system supports manual selection of tasks, evaluatees, and evaluators for QC evaluations.

When the results of the evaluations are entered using optical mark readers or the keyboard, the system automatically scores the results. When a QC evaluation is failed, a notice to the commander recommending decertification on the task is generated.

Training Component

The training component contains the computer assisted instruction and interactive video disk instruction.

Personnel Evaluation and Analysis Program (PEAP)

The Personnel Evaluation Analysis Program (PEAP) is a micro-computer aided trend identification and analysis program developed for use by aircraft maintenance quality assurance/deficiency analysis personnel. It was developed for the quick identification and accurate analysis of negative maintenance performance trends. PEAP was developed by the Air Force Logistics Management Center (AFLMC) using dBASE III. PEAP not only identifies negative personnel and equipment analysis performance trends, but also provides the data needed to determine the causes of those trends.

Background. The Air Force saw a need to shift the emphasis of aircraft maintenance quality assurance (QA) from one that centers on the individual who fails to meet quality

standards to one centered on finding the specific causes contributing to evaluation failures. Consequently, the AFLMC developed PEAP, a real-time, on-line performance trend identification and analysis system. This original version was fielded by TAC and Alaskan Air Command (AAC) in January 1988. MAC/LGM expressed an interest in PEAP and had AFLMC develop a modified version. The Final Report on this effort stated that HQ MAC/LCM implemented MAC PEAP command-wide on 1 Oct 88. Air Force Reserves (AFRES) associated with MAC units in the Fourth and Fourteenth Air Forces also implemented MAC PEAP at this time.

Function. There are four categories of quality assurance inspection/evaluations:

1.   *Personnel.* Evaluation of a maintenance action performed by the aircraft technician or supervisor.

2.   *Technical.* Inspection of equipment following a maintenance inspection or repair action.

3.   *Special.* Inspection initiated by higher headquarters, a weapons system manager, or the Deputy Commander for Maintenance (DCM). This inspection may be conditional or procedural compliance oriented.

4.   *Safety/Unsafe condition.* Unsafe act by an individual (Detected Safety Violation) or an unsafe condition in which maintenance personnel are not directly involved (Unsafe Condition Report).

Each event is also assigned a Type of Event Code (TEC) which details what kind of work was inspected. TECs are assigned by base level QA managers. The first two digits usually correspond with the Work Unit Code (i.e., 23 = Engines). The third digit denotes the specific event (i.e., 23A = Engine final major maintenance).

There are three phases to PEAP:

1.   *Initial Inspection/Evaluation.* Data is entered onto Form 30 in PEAP database.

2.   *Analysis.* PEAP provides nine analysis reports citing trends in TECs, work centers, equipment, etc. Two of these reports relate to personnel evaluation:

      a.   *Complete Personnel Evaluation Summary.* PEAP displays a summary of every personnel evaluation QA has performed in the last 12 months, sorted either alphabetically or numerically on the name or employee number, respectively of the personnel evaluated.

      A sample report form is shown here:

NAME	EMP NO	TOTAL	PASS	PASS RATE	CUTOFF FLAG	AVG SCORE	SCORE RATING
HUBBLE	00664	2	1	50.0	**	85.0	S
HUGGINS	00103	1	0	00.0	**	70.0	U
JONES	00028	2	2	100.0		100.0	O
MCDANIELS	02002	1	1	100.0		94.0	O

b.   *Single Individual Evaluation History Report.* Displays totals, pass rates, and average scores for the different types of QA evaluations performed on a single individual in the last 12 months. A sample report form is shown here:

Name: HUBBLE   Emp No: 00664

Pass Rate: 50.0%   Avg Score: 85.0%
Adj Pass Rate: 50.0%   Adj Avg Score: 85.0%

TYPE INSP	TOTAL	OUT	EXC	SAT	MAR	UNSAT	N/RAT
TE	0	0	0	0	0	0	0
CMA	0	0	0	0	0	0	0
CSI	2	1	0	0	0	1	0
CMI	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
EPE	0	0	0	0	0	0	0
DSV	0	0	0	0	0	0	0
UCR	0	0	0	0	0	0	0
TOTAL	2	1	0	0	0	1	0

3.   *Inspection Redirection Reports.* Reports generated here are used to measure and evaluate QA inspector productivity and, if necessary, redirect inspection efforts.

Quality Assurance Tracking and Trend Analysis System (QANTTAS)

The purpose of the Quality Assurance Tracking and Trend Analysis System (QANTTAS) is to help aircraft maintenance Quality Assurance (QA) personnel keep track of important information. It is an information tracking and trend analysis microcomputer package. QANTTAS is intended to serve as a prototype and as an interim procedure until a standard system is in place. The QA/QC subsystem envisioned for CAMS should replace this and any other non-standard program in use. The system was developed by the Air Force Logistics Management Center (AFLMC). The sponsoring organization is HQ United States Air Force in Europe (USAFE)/LG with HQ Pacific Air Forces (PACAF) and HQ AAC as cosponsors. Therefore, the procedures are tailored to Tactical Air Forces (TAF) policies.

Background. Since 1984 there have been substantial changes in MAJCOM policies on the QA function. Rather than route each inspection form, findings are collected and submir .d w- ·: ʹ ✓ in order to reveal negative performance trends. The QA managers were to conduct trena analysis to uncover negative performance indicators. This put a heavy tracking and data analysis burden on QA managers. TAC asked AFLMC to help in preparing an automated trend identification and analysis tool. The response was the Personnel Evaluation Analysis Program (PEAP) which was fielded by TAC, AAC. Air Force Systems Command (AFSC), and Air Force Reserves AFRES Tenth Air Force. A version was also created for MAC with their differences in QA policies incorporated. This MACPEAP was fielded by MAC and AFRES Fourth and Fourteenth Air Forces.

USAFE was not involved with PEAP, but as a TAF organization, its policies changed in step with those of TAC. The creation of the Product Improvement Branch (PIB) added another task for the QA personnel of compiling deficiency report information. Because of this and the other additional burdens, QA personnel soon began building automated tools to aid in keeping track of these various functions. HQ was uncomfortable with this due to the uncertainty of the accuracy and reliability of these products, as well as the difficulty they would have in inspecting and understanding each of these tools.

QANTTAS was developed to standardized the automated QA system across the command. It is admitted it is an interim system until the completion and installation of the QA/QC portion of CAMS. Program settings may vary from MAJCOM to MAJCOM. The default set depend on the MAJCOM guidance.

Function. QANTTAS assists QA management in tracking information for seven high interest areas of QA. Efficiencies are gained in the inspection/reporting process; the ability to identify negative trends, and greater control of product improvement related efforts.

The QANTTAS system includes the functionality of PEAP plus automated tracking in other areas including product improvement. PEAP was used as a functional prototype for inspection tracking, trend identification and analysis, therefore it is assumed that all functions described in PEAP are included in QANTTAS.

An inspection is identified in two ways: the inspection/evaluation category or type of inspection and the Type of Event Code (TEC) which details what kind of work was inspected. There are 5 inspection/evaluation categories in QANTTAS:

1. Technical
2. Personnel: Personnel Evaluation, Team Evaluation, Evaluator Proficiency Evaluation
3. Special
4. Management
5. Safety: Detected Safety violations, technical data violation, unsafe condition report.

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The following highlights the Personnel Category:

Personnel. Evaluation of maintenance personnel while performing a maintenance action. Within this category are three evaluation types:

1. *Personnel Evaluation (PE).* Evaluation of the person performing a task or supervising the performance of a task.

2. *Team Evaluation (TM).* Personnel performing maintenance as a team member are evaluated together and the overall result is reported as TM. Each individuals performance participation is recorded as type PE.

3. *Evaluator Proficiency Evaluation (EPE).* The EPE serves as a certification process for people performing evaluations. To qualify as an evaluator, one must be observed while performing a technical inspection and personnel evaluation.

Type of Event (TEC) codes are assigned by base level QA managers. The first two digits usually correspond with the Work Unit Code (i.e., 23 = Engines). The third digit denotes the specific event (i.e., 23A = Engine final major maintenance).

QANTTAS can provide a listing of inspections broken down on many criteria. For example, an individual's inspection history can be called up by entering the person's identification number.

SALLY

SALLY is described in the *Automated maintenance standardization and evaluation program report*, version 3.3 and 3.6, September 15, 1988. The report states that it should work well for any quality control function in all categories of Air Force Communications Command (AFCC) units. SALLY has been in use by the 1913CG quality control function since January 1986. The system satisfies all requirements of AFCCR 66-9, so it should be able to stand alone. SALLY is menu driven.

The functions for SALLY are:

1. Provides data bases for all inspections and evaluations required by AFCCR 66-9, chapter 4.

2. It will produce yearly, monthly, weekly, or anything in between schedule of inspections and evaluations due with the date they are to be accomplished.

3.	It will track report suspense and provide a list of those reports having passed a suspense date. This is done for reports due in to or due out of the Quality Control section.

4.	Using menu driven format, it will prompt an inspector through each phase of creating, printing, and following up on all required inspection or evaluation reports.

5.	Using menu driven format, the trend analysis reviews all discrepancies previously entered via the inspection generation option of the program. Trend status reports are generated that when analyzed will provide data on deficiency trends by tracking codes, work center, type of inspection, type of equipment and date. (The report does not say what the tracking codes are, could be tied to individuals).

Four data bases are provided: technical inspections, personnel evaluations, activity inspections, and special inspections.

Options Listed on Main Menu are:

1.	Inspection Data Base Maintenance- maintain or update data base. Input data at this option.

2.	Periodic Inspection Schedules- when user enters a date, system produces inspection schedules to screen or printer for technical, special and activity inspections and personnel evaluations.

3.	Daily Report Suspense- produces list of inspections that were not entered on date due.

4.	Generate Maintenance Standardization and Evaluation Program (MSEP) Inspection Reports- produces initial and follow-up inspection/evaluation reports in the AF Form 2419/2420.

5.	Analyze MSEP Trends- reports sorted and selected so that it is easier for quality control inspector to analyze deficiencies trends. (Does not indicate whether personnel evaluations as well as equipment inspections can be analyzed).

Information Included in Reports are:

1.	Technical, Special and Activity Inspections- information on equipment only, no personnel information.

2.	Personnel Evaluation- Name, employee number, last evaluation, next evaluation, task evaluated, evaluation type (initial/follow on/special), inspector (name and rank) and a summary of the evaluation. Summary of evaluation includes errors noted, task rating (satisfactory or unsatisfactory), and any additional comments.

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PMEL Automated Maintenance System (PAMS)

The PMEL operates differently than other AF maintenance operations. They use the PMEL Automated Maintenance Systems (PAMS), a form of CAMS specifically created for PMEL. A part of PAMS is the Quality Verification Inspection (QVI) Level. The QVI Level is an Air Force-wide method for determining who gets their work inspected and when it gets inspected within PMEL. Also, PAMS seems to monitor work-time and work quality closer than the CAMS system.

Aerospace Life Support Management System (ALSMS)

ALSMS is used exclusively in life support specialties in MAC. The purpose of ALSMS is to automate record keeping for the life support equipment inspections. The system alerts the supervisory personnel within life support when a piece of equipment is up for inspection. Data is stored for the past six inspections on each piece of equipment. Inspections are conducted on the equipment itself. No individuals are inspected or associated with the equipment being inspected. The database is local, within the shop. It is a FOXBASE software system.

SUMMARY AND CONCLUSIONS

Summary

The results of this study are summarized in the matrix presented as Figure 2 in this section. The following summarizes the findings displayed in the matrix.

Accessibility. The accessibility of data is a key factor determining if data can be used for validation of selection criteria. Paper-and-pencil records kept in personnel files would be very difficult to access. All of the systems listed in the matrix are automated and have data bases. Therefore, the data are adequately obtainable. The following listing is more of an informational tool of how we would access the data, rather than whether it is accessible or not.

Owner. The owner of the systems on which the data are contained is MAJCOM for CAMS and AOTS. The remainder of the procedures are owned by specific commands or specialties: TAC and MAC own PEAP; USAFE, PACAF, and AAC own QANTTAS; AFCC owns SALLY, and Air Force PMEL owns PAMS.

Location. For all of the systems the location of the data is the installation level or lower.

Storage. The method of data storage varies in the different systems. The data for CAMS is stored on a mainframe. PAMS is stored on a local mainframe. AOTS is stored in a PC network. PEAP, QANTTAS and SALLY are all PC-based software.

Data Domain. The data domain indicates the mission, occupation, and echelon associated with the data.

Mission. The mission is the purpose for the operational system. The mission for AOTS is to automate and enhance OJT procedures and activities for all AFSs which have formal OJT functions. CAMS mission is to provide an automated maintenance management system for the base-level Air Force maintenance community. PEAP, QANTTAS, and SALLY are to automate the maintenace system and analyze trends in equipment and personnel for all the maintenance AFSs. The mission for QVI in PAMS is to have a standardized, stringent inspection system for PMEL.

Occupation. The occupation is the specific AFS, group of AFSs, or career field associated with the operational system. CAMS, PEAP, QANTTAS, and SALLY are for all maintenance AFSs. PAMS is PMEL specific. AOTS is for use with all AFSs which conduct OJT programs.

PARAMETERS	Procedure 1 CAMS - 1 OJT - JOS	Procedure 2 CAMS - 2 OJT-Supv Rating	Procedure 3 CAMS - 3 QA/QC	Procedure 4 CAMS - 4 CDC
ACCESSIBILITY OF DATA				
Owner	MAJCOM	MAJCOM	MAJCOM	MAJCOM
Location	Installations	Installation	Installation	Installation
Storage	Mainframe	Mainframe	Mainframe	Mainframe
DATA DOMAIN				
Mission	Maintenance	Maintenance	Maintenance	Career Dev.
Occupation	All Maint AFS	All Maint AFS	All Maint AFS	All Maint AFS
Echelon	Workcenter	Workcenter	Workcenter	Workcenter
PARTICIPANTS				
Individual,	Individual:	Individual:	Individual:	Individual:
Team, Unit	Name and ID number	Name	Name	Name
ITEM MEASURED				
Production,	JOS Completion	Performance	Discrepancies:	Course Exam (CE)
Nr. Mistakes,		0=Projected	Major or Minor	Completion date
Category,		1=Satisfactory	by category,	CE score
Nr. Sorties		2=Unsat	Type of error	CE status-P/F
ASSOCIATED DATA		Eval Date & Evaluator	Equip or Job	Crse code & Nr./ Vol /Strt&end date
PROCEDURE				
Observation,	Observe/test/	Observation	Observation,	Written test
Self-report	interview/ hands-on		Interview, & Post-repair insp.	
RECORDING METHOD				
Written, AF form,	On-screen form	On-screen form	AF Form &	On-screen form
Maintenance Record			On-screen form	
TYPE				
Subjective,	Subjective	Subjective	Subjective	Objective
Objective,				
Behavioral				
RESEARCH QUESTION				
Readiness,	Record of task	Readiness		Gen AF knowledge
Job performance,	progress	Job Performance	Job Performance	
MPT issues				
FIDELITY OF DATA				
Reliability,				
Content-validity				
TIMING				
Unannounced,	Announced and	Announced and	Announced and	Announced,
Pretest, Posttest,	Unannounced	Unannounced	Unannounced	Scheduled
Other				
BIAS				
All members,	All Members	All members	Random	All members
Random selection,				
Other				
CURRENT USE OF DATA	Chk OJT progress	Training Eval	(Projected)	Career Dev. Eval

Left margin labels: Content, Performance Measurement, Evaluation, Utility

**Figure 2 - Operational Systems and Performance
Measures Matrix**

PARAMETERS	Procedure 5 AOTS-1 OJT-JOS	Procedure 6 AOTS-2 Knowledge Eval	Procedure 7 AOTS-3 Performance Eval	Procedure 8 PEAP MAC PEAP
ACCESSIBILITY OF DATA				
Owner	MAJCOM	MAJCOM	MAJCOM	TAC and MAC
Location	Installation	Installation	Installation	Installation
Storage	PC network, M/F	PC network, M/F	PC network, M/F	PC
DATA DOMAIN				
Mission	OJT	OJT	OJT	Maint. Trends
Occupation	All AFS	All AFS	All AFS	All Maint AFSs
Echelon	Workcenter	Workcenter	Workcenter	Workcenter
PARTICIPANTS				
Individual,	Individual:	Individual	Individual	Individual and
Team, Unit	Name			team
ITEM MEASURED				
Production,	Performance tasks	Knowledge :	AOTS selected/	Inspection
Nr. Mistakes,	JOS/STS	Selected items	Specified tasks	pass/fails
Category,		or auto selected		avg scores
Nr. Sorties		items		score rating
ASSOCIATED DATA				
				Employee No.
PROCEDURE				
Observation,	Observation,	Written or	Off-line using	Observation and
Self-report	Testing, Interview,	on-line test	Oral Test Guide &	post-repair
	Hands-on testing		Perf Eval Chklist	inspection
RECORDING METHOD				
Written, AF form,	On-screen form	Optical scan form	Optical scan form	AF form and
Maintenance Record		or on-screen form	or on-screen form	on screen form
TYPE				
Subjective,	Subjective	Objective	Subjective	Subjective
Objective,				
Behavioral				
RESEARCH QUESTION			—	
Readiness,	OJT Qualification	Job knowledge	Job performance	Trend analyses
Job performance,				in maint
MPT issues				performance
FIDELITY OF DATA				
Reliability,				
Content-validity				
TIMING				
Unannounced,	Announced	Auto scheduled	Unannounced	Announced and
Pretest, Posttest,		or announced by		unannounced
Other		evaluator, supv.		(determined by
		or trng manager		installation)
BIAS				
All members,	All Members	All members	Random or	Random:
Random selection,			Auto selected	sometimes based
Other				on past trends
CURRENT USE OF DATA	(Proposed)	(Proposed)	(Proposed)	Analyze
				personnel and
				equipment
				problems

Left margin vertical labels: Content / Performance Measurement / Evaluation / Utility

Figure 2 - Operational Systems and Performance Measures Matrix (Continued)

PARAMETERS	Procedure 9 QANNTAS	Procedure 10 SALLY	Procedure 11 PAMS QVI Levels
ACCESSIBILITY OF DATA			
Owner	USAFE PACAF AAC	AFCC	PMEL
Location	Installation		Installation
Storage	PC	PC	PAMS computer
DATA DOMAIN			
Mission	Maint. Trends	Maintenance	Maintenance
Occupation	All Maint AFSs	All maint AFSs	PMEL
Echelon	Workcenter	Workcenter	Workcenter
PARTICIPANTS			
Individual, Team, Unit	Individual and team	Individual	Individual
ITEM MEASURED			
Production, Nr. Mistakes, Category, Nr. Sorties	Inspection pass/fails avg scores score rating	Discrepancies Type Category Task rating	Inspections w/o failures
ASSOCIATED DATA	Employee No. Name	Task, eval type	
PROCEDURE			
Observation, Self-report	Observation and post-repair inspection	Observation	Post-repair inspection
RECORDING METHOD			
Written, AF form, Maintenance Record	AF form and on-screen form	On-screen form	On-screen
TYPE			
Subjective, Objective, Behavioral	Subjective	Subjective	Inspection-subjective; Level changes-objective
RESEARCH QUESTION			
Readiness, Job performace, MPT issues	Trend analyses in maint performance	Quality Control	Demonstrated ability Competency
FIDELITY OF DATA			
Reliability, Content-validity			
TIMING			
Unannounced, Pretest, Posttest, Other	Announced and Unannounced		Unannounced-checked every nth time
BIAS			
All members, Random selection, Other	Random, sometimes based on past trends	Random	Systematic based on level
CURRENT USE OF DATA	Analyze trends in personnel and equip problems	Schedule quality control evaluations	Specify level of qualification/ competency Frequency of checks required on jobs performed

Left margin labels: Content / Performance / Measurement (vertical), Evaluation, Utility

Figure 2 - Operational Systems and Performance
Measures Matrix (Concluded)

Echelon. Echelon is the level at which data are collected and entered into the system. The data may be entered at the individual, workcenter, unit, or organization level. All the systems included in the matrix have data entered at the workcenter level.

Participants. In order to validate another measurement, the performance indicators we select must be tied to an individual, not a team or a unit. CAMS, AOTS, SALLY, and PAMs contain data on the individual, while PEAP and QANTTAS may contain data on the individual, team, or a member of a team. It poses a problem when the team or one member of a team is measured on a team task because it is difficult to tie the performance to an individual.

Item Measured. The item measured is the item or function on which the measure is taken. Within CAMS, each of the procedures included in the matrix measures different things. The OJT measures JQS completion, OJT-Supervisory Ratings are measures of job performance, QA/QC is the number of inspection discrepancies, and CDC is the score on the course exam.

AOTS also has different types of measures in each of the procedures. Task Qualifications is a record of certification on JQS. Knowledge Evaluation is measure of knowledge about task performance. Performance Evaluation is an off-line evaluation of performance on evaluator selected or system specified tasks.

PEAP, QANTTAS, SALLY, and PAMS are all measures of inspection discrepancies. The type of inspections vary in all of the procedures (i.e., over-the-shoulder, task, etc.).

Associated Data. The associated data is an informational parameter to help determine what other information can be attached to the data. This varies between all of the measures, but it is not a consideration in choosing appropriate measures.

Procedure. The procedure is the method used to obtain the data. Some common procedures are observation, written and oral tests, over-the-shoulder and post-repair inspections. CAMS JQS and AOTS JQS use several different procedures including observation, written tests, interviews, and hands-on tests. CAMS supervisory ratings and SALLY are based on observations only. The QA/QC related measures (i.e., PEAP, QANTTAS, QVI Levels, and CAMS QA/QC) use observation and post-repair inspections. CAMS QA/QC also uses interviews. Several measures use written test: CAMS CDC and AOTS Knowledge Evaluation. The AOTS Performance Evaluation is by off-line testing using an oral test guide and a performance evaluation checklist.

Recording Method. All of the procedures have on-screen forms on which the data are recorded. CAMS QA/QC, PEAP, and QANTTAS also use supplementary Air Force forms. AOTS Knowledge Evaluation and Performance Evaluation have the option of using an optical scan form to enter the data into the computer and automated scoring.

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Type. All of the procedures are subjective measures except the measures involving tests: CAMS CDC and AOTS Knowledge Evaluation. The QVI Levels have objective and subjective components. The inspections themselves are subjective, but the QVI Level changes are objective.

Research Question. Each of the procedures have individual research questions. This information indicates the reason the procedure was originally created or its purpose. This information is helpful in understanding the content of the procedure.

Fidelity of Data. The fidelity of the data, including reliability and content-validity, is listed on the matrix as a parameter because of the importance of this information in evaluating a measure. We were unable to determine fidelity for any of the measures.

Timing. AOTS Performance Evaluation and QVI Levels are the only measures which are unannounced all of the time. The CAMS CDC and the AOTS JQS are both announced, and the remainder of the measures are announced and unannounced in different situations.

Bias. Several of the procedures measure the entire population (i.e., for CAMS the JQS, supervisory ratings, and CDC, and for AOTS the JQS and Knowledge Evaluations). The CAMS QA/QC, AOTS Performance Evaluation, and SALLY are always random. PEAP and QANTTAS are usually random, but not always. Sometimes the inspections are based on past trends and in other cases the supervisor selects the best person in his shop to perform the task being evaluated. The rules for selection of who is to inspected by QA seem to differ between bases. The QVI Level is unique in that the inspections are randomly chosen within the constraints of the current QVI level of the individual.

Current Use of Data. The current use of the data varies from procedure to procedure. This information is helpful in understanding the operational use of the procedures and their current status.

Table 1 indicates the extent the operational systems described in this paper are used in the five AFS of interest. The predicted use of AOTS by the specialties is also displayed. CAMS, PEAP, and QANTTAS are used in each of the specialties except PMEL. PAMS is a form of CAMS specifically created for PMEL, therefore this specialty does not use CAMS. SALLY is used only in AFCC specialties. ALSMS was created for Aircrew Life Support, and that specialty is its only user. Unlike the other systems, PEAP is used by the QA/QC personnel to determine the trends within the indicated specialties, not by the individuals within the specialties.

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Table 1. Operational Systems by Air Force Specialty (AFS)

AFS	CAMS	AOTS	PEAP	QANTTAS	SALLY*	PAMS	ALSMS
Aerospace Propulsion Specialist (454X0)	X	✓	X	X			
Communication and Navigation System Specialist (455X2)	X	✓	X	X			
Aerospace Ground Equipment Mechanic (454X1)	X	✓	X	X			
Precision Measuring Equipment Laboratory Specialist (324X0)		✓				X	
Aircrew Life Support Specialist (122X0)	X	✓	X				X

X	Current use
✓	Proposed use
*	Used only in AFCC

Conclusions

It is clear from the summary of the matrix, as shown in Figure 2, that we did not discover any Air Force-wide job performance measures at the operational level that could function as surrogate measure for JPMS developed HOPT. The automated systems are for the most part MAJCOM specific. There are no central Air Force-wide data bases associated with the systems reviewed. Data bases are at MAJCOM, installation, or unit level. However there are a few systems that have potential for use. These are the PAMS, CAMS, and AOTS.

PAMS. The PMEL AFS uses QVI Level within PAMS to determine who gets their work inspected and when the inspection takes place. Although used by PMEL as a quality control function for equipment repair and calibration, this measure is an indicator of job performance. It measures the ability to perform work without errors. The inspection is on individuals and is always unannounced. The procedure is systematic in determining which items to inspect. The inspection itself, although very structured, is subjective, but the system used for changing an airman's QVI Level is very structured and objective. The information is automated and stored at the unit level.

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CAMS. Although CAMS was developed to automate maintenance procedures it also implements the OJT requirements in Air Force Regulation 50-23. CAMS can be used to automate OJT procedures. The data base contains a record of the progress of an airman during OJT. In addition, CAMS has supervisor ratings of OJT performance (satisfactory or unsatisfactory), CDC course exam scores, and AKT scores. When the QA/QC module is implemented the data base will include discrepancy data and the results of personnel evaluations.

CAMS contains data that meets the criteria for a candidate surrogate measures of job performance. Although not Air Force-wide, the data base is at the installation level with access at the MAJCOM level. It contains a record of OJT performance which is based on observation, interview, and hands-on testing; has supervisor ratings; and contains CDC and AKT scores.

AOTS. AOTS was designed to be in strict compliance with Air Force Regulation 50-23. The system was designed specifically to improve the procedures for OJT. A fully operational AOTS could provide the research community with a valuable source of operational measures. What makes AOTS significant is that it focuses on job position qualification, whereas OJT focuses on job task qualification. The system data base will contain the results of performance evaluations accomplished for pre-training, post-training, and for quality control purposes. The job performance evaluations are conducted off-line using system generated evaluation guides. There is a GO/NO GO rating for each step in the procedure being evaluated. When the results are entered into the system, the system evaluates the overall procedure. Implications are:

- Pre-training evaluations can be an indicator of how well the technical school prepared the airman for the job.

- Pre-training and post-training evaluations can indicate of how well the AKT screened personnel for assignment to the AFS.

- Post-training and quality control evaluations can be assessed as surrogate JPMS measures.

The AOTS data base will also contain the record of OJT progress (JQS/STS) and the results of evaluations of knowledge of how tasks are performed. Since any measure of job performance should take into account the total person in the total job, these data could be used as a composite part of a surrogate measure of job performance. Also, SKT, CDC, and EPR scores could be a part of the composite measure.

All of the data in the AOTS data base are keyed to the individual airman. The expansion plan calls for a fully networked PC-based system. A networked system would permit ready access to the data.

GLOSSARY

Abbreviations

AAC Alaskan Air Command

AFCC Air Force Communications Command

AFHRL Air Force Human Resources Laboratory

AFJQS Air Force Job Qualification Standard

AFLMC Air Force Logistics Management Center

AFMPC Air Force Military Personnel Center

AFRES Air Force Reserves

AFS Air Force Specialty

AFSC Air Force Systems Command

AGE Aerospace Ground Equipment

AKT Apprentice Knowledge Test

ALS Aircrew Life Support

ALSMS Aerospace Life Support Management System

AOTS Advanced On-the-Job Training System

APR Airman Performance Report

ATC Air Training Command

BTS Base Training System

CAMS Core Automated Maintenance System

CDC Career Development Course

CJQS Command Job Qualification Standard

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CMA	Completed Maintenance Action
CMI	Completed Maintenance Inspection
CSI	Completed Supervisory Inspection
DCM	Deputy Commander for Maintenance
EPE	Evaluator Proficiency Evaluation
EPR	Enlisted Performance Report
FTD	Field Training Detachment
HOPT	Hands-On Performance Test
JKT	Job Knowledge Test
JPM	Job Performance Measurement
JPMS	Job Performance Measurement System
JQS	Job Qualification Standard
MAC	Military Airlift Command
MAJCOM	Major Command
MSEP	Maintenance Stardardization and Evaluation Program
NCO	Noncommissioned Officer
OJT	On-the-Job Training
OMC	Occupational Measurement Center
PACAF	Pacific Air Force
PAMS	PMEL Automated Maintenance System
PE	Personnel Evaluation
PEAP	Personnel Evaluation and Analysis Program

PIB	Product Improvement Branch
PMEL	Precision Measuring Equipment Laboratory
QANTTAS	Quality Assurance Tracking and Trend Analysis System
QA/QC	Quality Assurance/Quality Control
QVI	Quality Verification Inspection
SAC	Strategic Air Command
SALLY	Automated Maintenance Standardization and Evaluation Report
SE	Supervisory Evaluation
SKT	Specialty Knowledge Test
STS	Specialty Task Statements
SME	Subject Matter Expert
TAC	Tactical Air Command
TAF	Tactical Air Forces
TE	Task Evaluation
TEC	Type of Event Code
TTDB	Training Technology Data Base
TPDC	Training Performance Data Center
UGT	Upgrade Training
USAFE	United States Air Force in Europe
WAPS	Weighted Airman Promotion System
WTPT	Walk-Through Performance Test

APPENDIX A

INTERVIEW PROTOCOL

We are from the Human Resources Research Organization (HumRRO). We are under contract to the Air Force Human Resources Laboratory to examine job performance measures currently used in the Air Force. The purpose of this interview is to get as much information as possible on current formal and informal methods used by supervisors and others to assess an individual's job performance.

1.   Do you know of any individual job performance measures that are routinely collected?

2.   Are other records or information collected that indicate job performance? Are these used as performance measures in any way?

3.   What are the names of these measures?

For each measure named ask the following questions:

4.   *(If not indicated by name of measure)* What type of measure is this (i.e., Rating form, Skill Knowledge Test (SKT), etc.)?

5.   Where is this data kept?

6.   In what form is it maintained (e.g., computer, hard copy)?

7.   Who controls the access to this data?

8.   Would the data be accessible to the research community (e.g., HRL)?

9.   How widely used is this measure? Is the measure Air Force-wide or is the use limited to specific installations or unit levels, etc.?

10. *(If the function or task that is being measured has not been indicated yet)* What is the function or task that is used in the measure? For example, is there a certain procedure that is rated, or is it a measure of units of production, or number of mistakes?

11. Who are the participants in this measure? What is the rank, time in service (e.g., first enlistment) of the Airmen on which this measure is used?

12. *(If the procedure has not been indicated yet)* What is the procedure used to get this information on the Airmen? Are they observed, is it a paper and pencil test, or is there

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some other way to collect the measurement information (i.e., electronic transmission)?

13. How is the information recorded? Is it a checklist, a special form, a standard Air Force form, or is the information on other records previously recorded?

14. What is the intended purpose of collecting this data (i.e., training effectiveness, unit readiness, promotion, etc.)?

15. Do you use it for any other purpose?

16. Does the airman take this test more than once? What are the locations? What is the time difference between testing?

17. *(If a subjective measure)* Who gives the ratings? Does more than one person administer this measure?

18. What job or task(s) is this measure aimed at tapping? Are there any other performance measurement systems measuring similar tasks?

19. Are the airmen told in advance that they will be assessed? If so, how far in advance?

20. How often is the measure administered? Is it given once, throughout a certain job, or periodically throughout career?

21. If given periodically (e.g., throughout a training session, or throughout the time in the Air Force) at what point(s) is it given?

22. Who is assessed by this measure (e.g, a few, a group, or all of the Airmen)? How is it determined how many will participate? How is it determined who will participate?

23. What is done with the data once it is collected? Who receives the data? How is it used?